



# Natural Asset Inventory and Valuation Project Update

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October 28, 2019

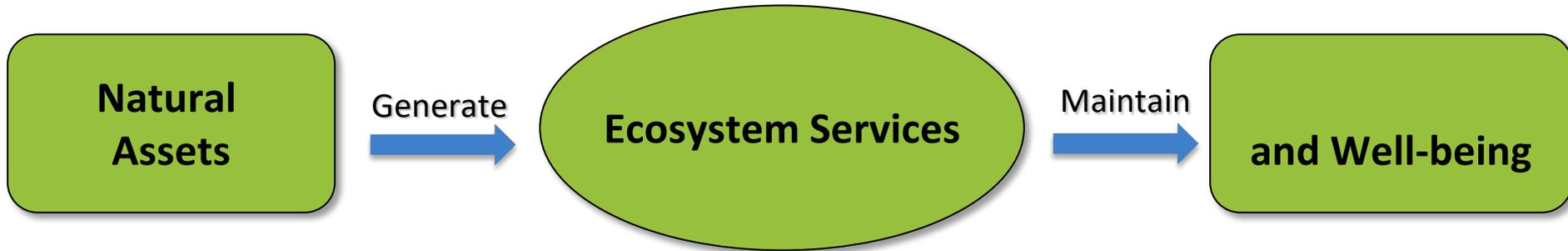


# Natural Asset Inventory and Valuation Project

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- Natural Assets part of Town's asset portfolio;
- O. Reg. 588/17: Green infrastructure assets needs to have strategies and plans in place.
- \$170K was approved in 2019 Capital Budget
- Project Lead by CVC & Partly funded by FGBF
- Phase 1: *NA Inventory & Services Valuation*
- Phase 2: Business cases for specific NA categories - *2020*

# Background on Ecosystem Services



## Services Include:

- Stormwater Management (i.e. protection from floods)
- Air Quality Improvement
- Drinking Water Quality Enhancement
- Property Value Appreciation
- Urban Heat Island Reduction
- Recreation and Tourism
- Carbon Storage and Sequestration
- Waste Assimilation

## Benefit Categories Include:

- Physical
- Mental
- Social
- Economic

## Natural Asset Types Include:

- Streams
- Woodlands
- Wetlands
- Meadows
- Open Green Spaces

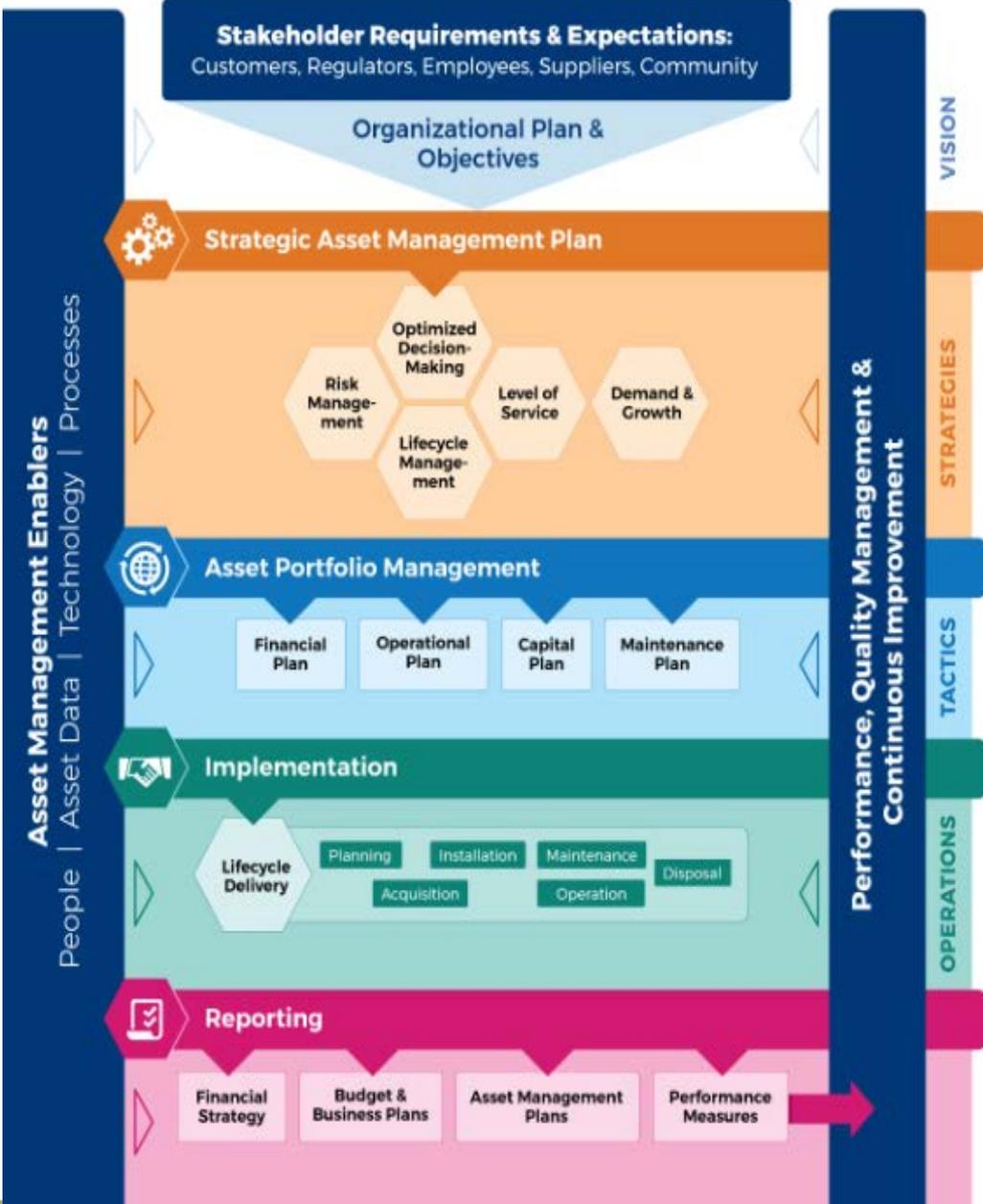
# Natural Assets Project Goals:

- Measure the contribution of natural assets in municipal service delivery
- Incorporate their level/value of services with existing asset management frameworks



# Natural Assets Project Rationale:

- Comply with with the O.Reg.588/17: Asset Management Planning in Municipal Infrastructure
- Ensure sustainable provision of services
- Increase infrastructure asset portfolio resiliency to Climate Change

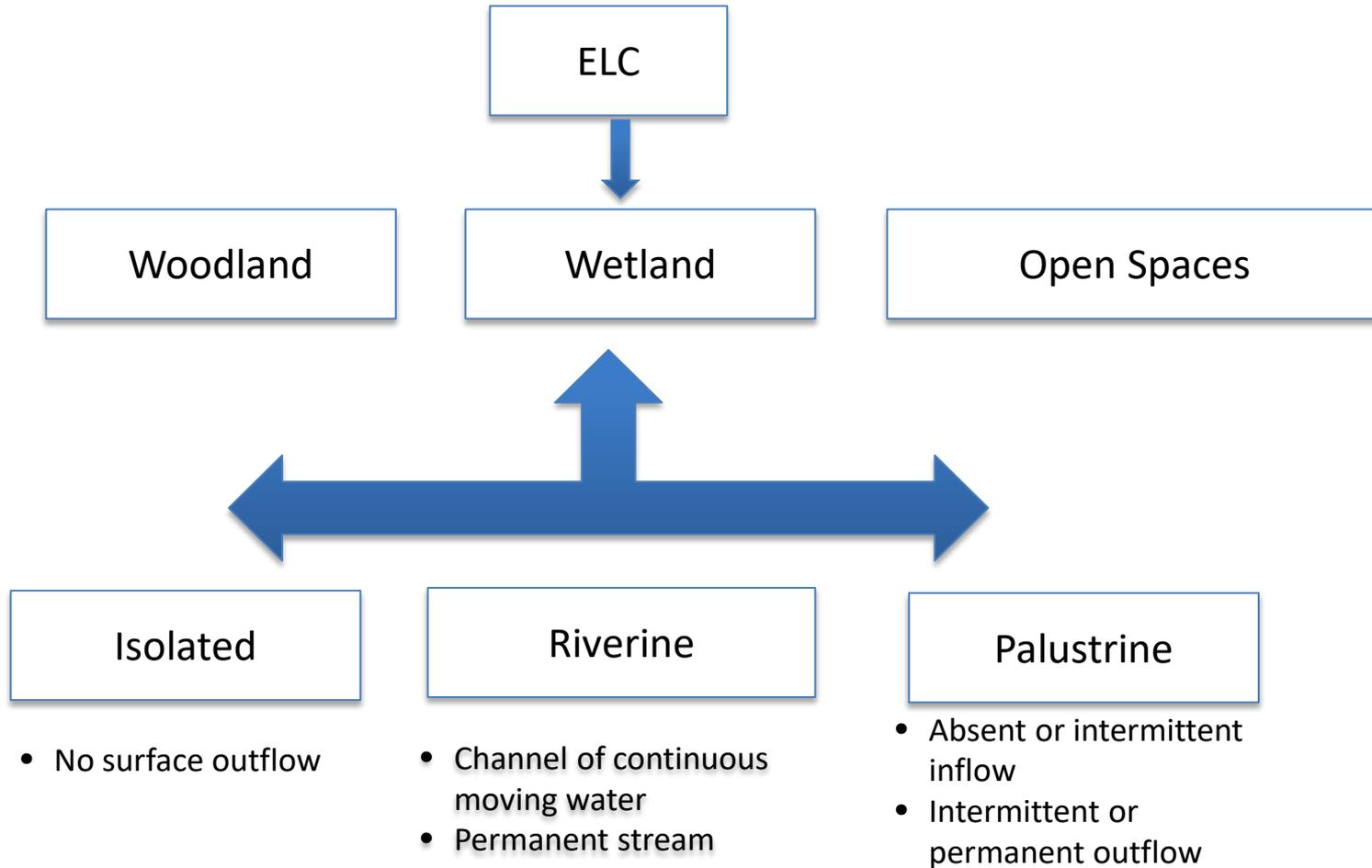


# Accomplishments in Phase 1 (2019)

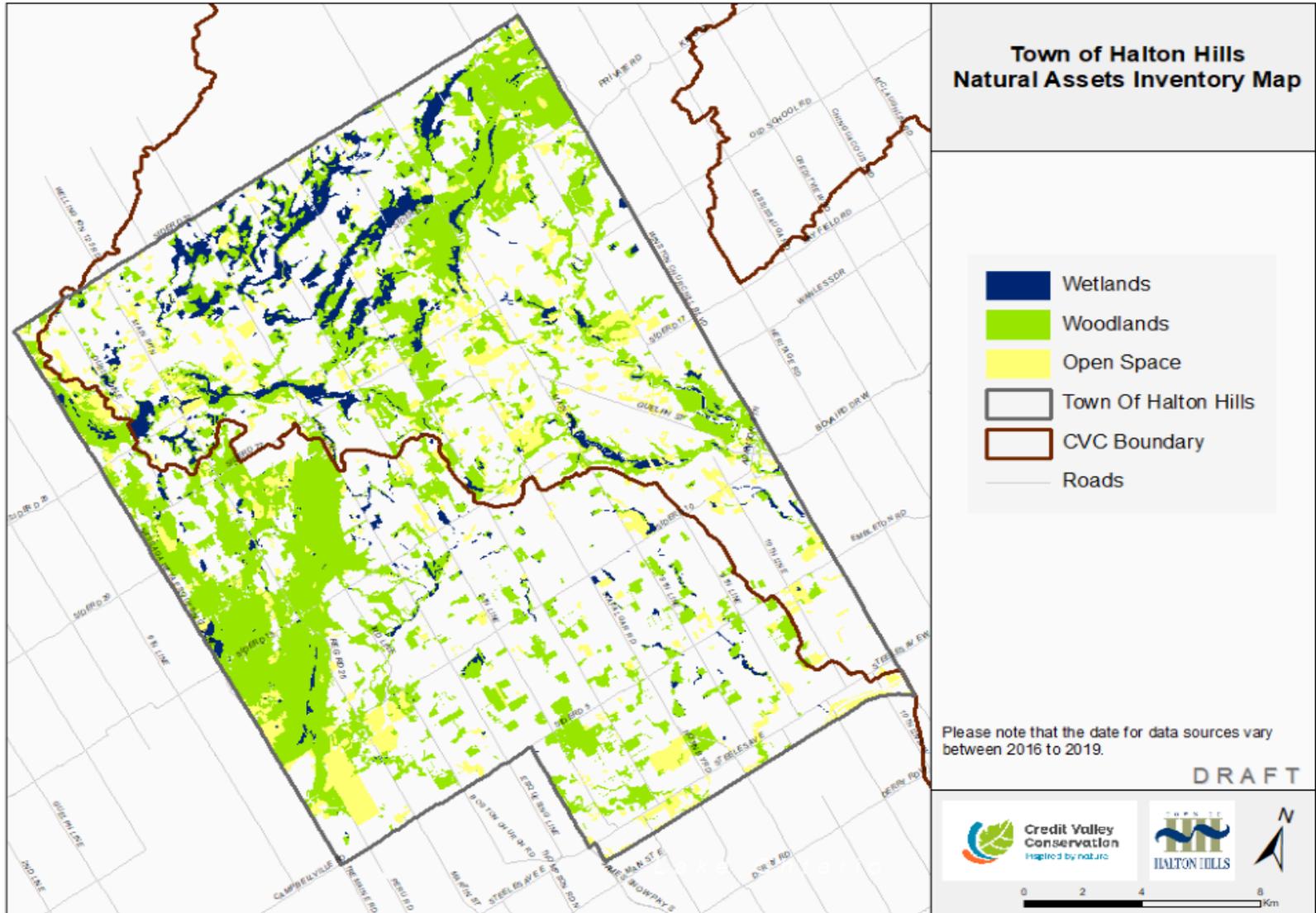
## Natural Assets: Inventory and Assessment of Stormwater Services

- Obtained GIS data and performed QA/QC
- Categorized natural assets and delineated their drainage area
- Applied hydrology model to estimate level of stormwater management (SWM) services under *existing* and *climate change* conditions
- Valued SWM services provided by natural assets in the Town of Halton Hills
- Mapped SWM service values provided by natural assets in the Town of Halton Hills

# Natural Assets Classes



# Inventory of Natural Assets



# Hydrology Modeling and Valuation Approach

- Model existing Natural assets (NAs) and determine **peak flow reduction and water quality** control (Total Suspended Solids and Total Phosphorous reduction) under *existing and future climate*



Open green spaces



Forests/Woodlands



Wetlands –  
Isolated, Palustrine, and Riverine

- Remove NAs and determine size of stormwater infrastructure required to match flow/water quality services provided by NAs
- Determine capital cost of required constructed assets to value services provided by natural assets under *existing climate* and *future climate* (2065)

	Rainfall depth (mm)
Existing Climate	124.5
Climate Change (2065)	132.0

# Results: Stormwater *Quantity* Performance (Existing Conditions)

Natural Asset Type	Asset and Drainage Area			Design Storm (100 year return period)		
	Feature Area (Ha)	Drainage Area (Ha)	Imperviousness of Drainage Area	Volume in/out (m <sup>3</sup> )	Volume Reduction	Peak Flow Reduction
Wetland 1: Palustrine	1.58	1.98	5%	3,192/2,010	37%	69%
Wetland 2: Isolated	1.11	13.9	5%	2,650/0	100%	100%
Wetland 3: Riverine	12.08	2,643	34%	2,005,050/ 1,980,330	1%	20%
Woodland	28.74	46.8	5%	57,776/34,602	40%	84%
Open Green Space	1.80	30.2	3%	15,361/13,950	9%	26%

# Results: Stormwater *Quality* Performance (Existing Conditions)

Natural Asset Type	Stormwater Quality Results			
	Total Suspended Solids Load In/Out	Total Suspended Solids Load Reduction	Total Phosphorus Load In/Out	Total Phosphorus Load Reduction
Wetland 1: Palustrine	77.5/ 1.8	98%	0.31/ 0.01	96%
Wetland 2: Isolated	1,111/ 0	100%	1.68/ 0	100%
Wetland 3: Riverine	634,060/ 413,470	35%	1,673/ 1,088	35%
Woodland	2,659/ 28.6	99%	5.97/ 0.11	98%
Open Green Space	775/ 116.3	85%	2.08/ 0.59	72%

# Results: Equivalent Stormwater Storage Capacity

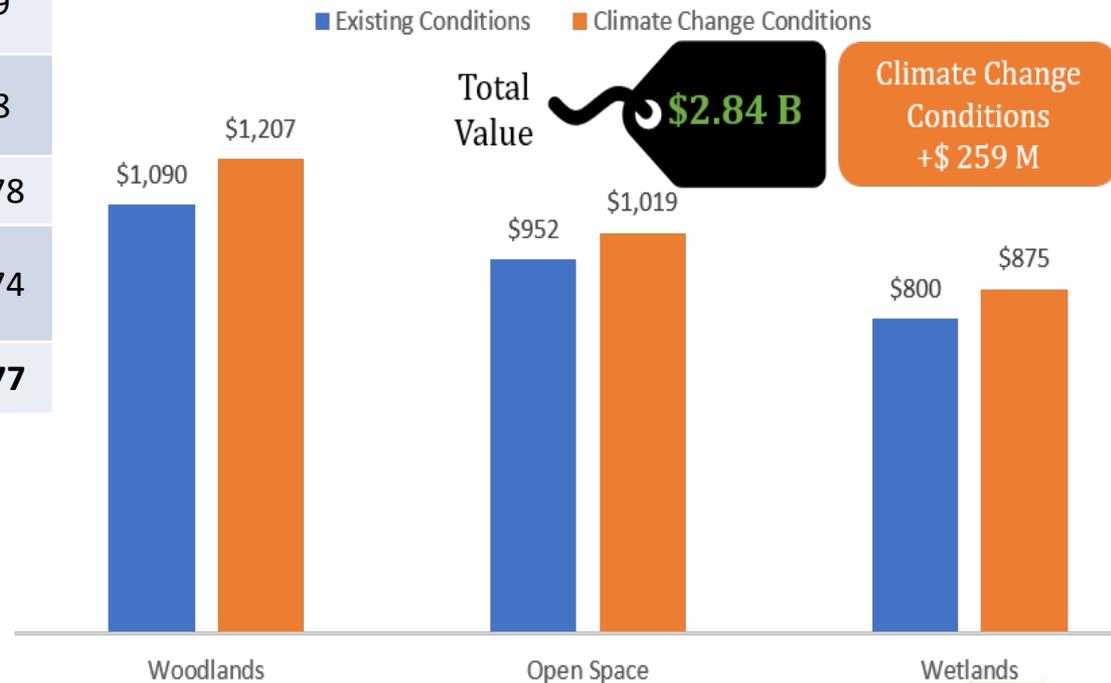
Natural Asset Type	Existing Climate Conditions	Climate Change Conditions
	SWM Capacity Required to provide services equivalent to NA (m <sup>3</sup> )	SWM Capacity Required to provide services equivalent to NA (m <sup>3</sup> )
Wetland 1: Palustrine	874	934
Wetland 2: Isolated	5528	6284
Wetland 3: Riverine	59190	63675
Woodland	26550	29400
Open Green Space	4020	4303

# Results: Value of SWM Services

## All Natural Assets in the Town of Halton Hills

Natural Asset Type	Value of NAs Existing Conditions	Value of NAs Climate Change
Wetland 1: Palustrine	\$161,630,039	\$172,725,910
Wetland 2: Isolated	\$262,925,466	\$298,882,889
Wetland 3: Riverine	\$375,219,380	\$403,671,328
Woodland	\$1,089,687,666	\$1,206,659,878
Open Green Space	\$951,681,672	\$1,018,679,874
<b>All NAs</b>	<b>\$2,841,144,221</b>	<b>\$3,100,619,877</b>

Value of SWM Benefits (\$M) from Natural Assets in the Town of Halton Hills

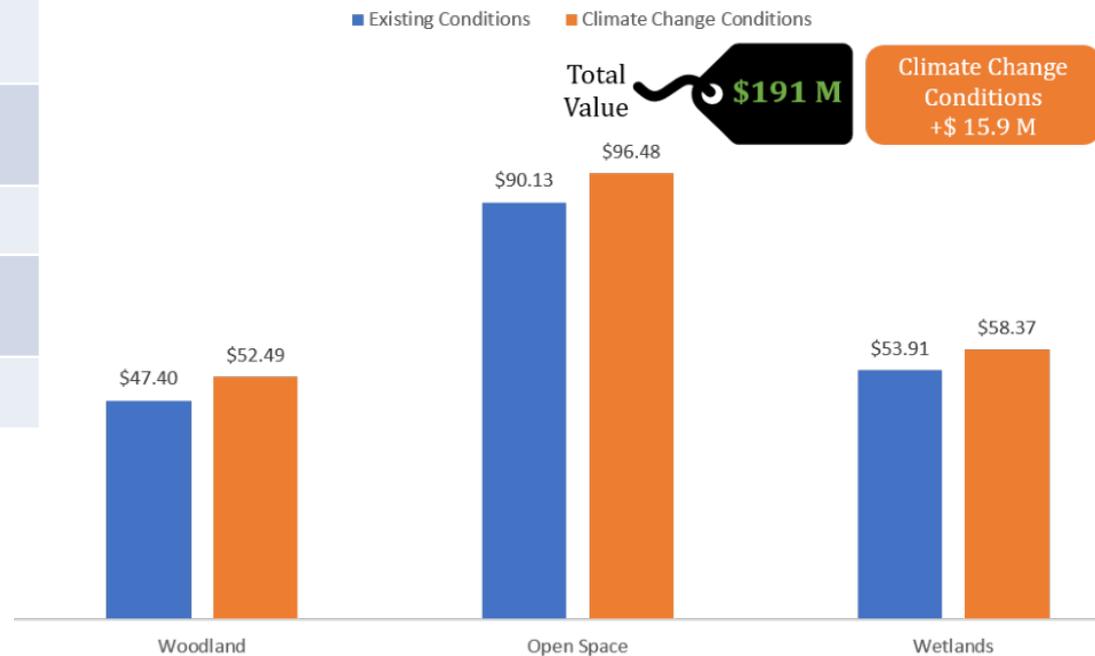


# Results: Value of SWM Services

## Natural Assets *owned* by the Town of Halton Hills

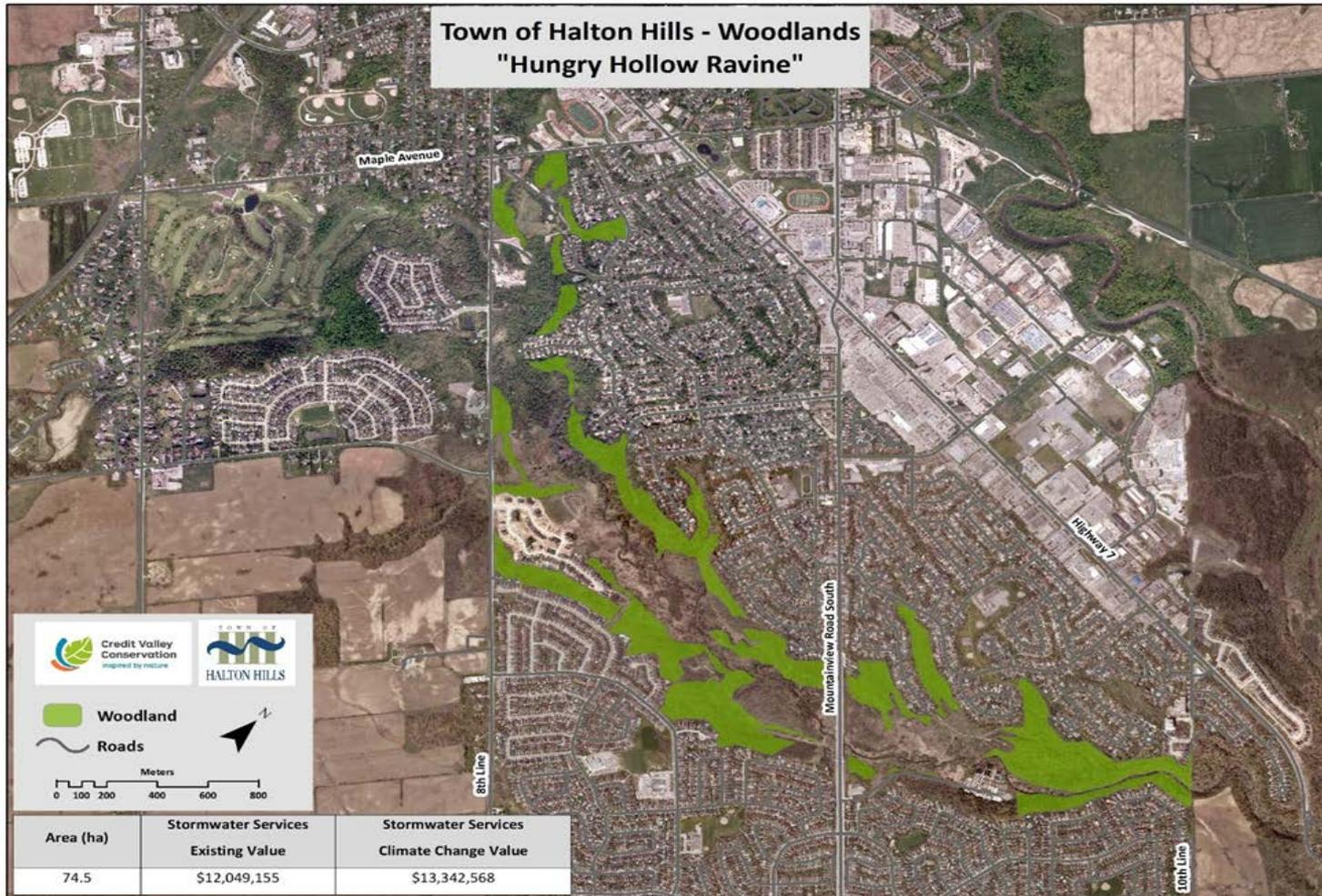
Natural Asset Type	Value of NAs Town-owned Existing Conditions	Value of NAs Town-owned Climate Change
Wetland 1: Palustrine	\$3,638,289	\$3,888,057
Wetland 2: Isolated	\$6,497,636	\$7,386,246
Wetland 3: Riverine	\$43,772,880	\$47,092,068
Woodland	\$47,399,512	\$52,487,599
Open Green Space	\$90,129,942	\$96,475,072
<b>All NAs</b>	<b>\$191,438,259</b>	<b>\$207,329,042</b>

Value of SWM Benefits (\$M) from Owned Natural Assets in the Town of Halton Hills



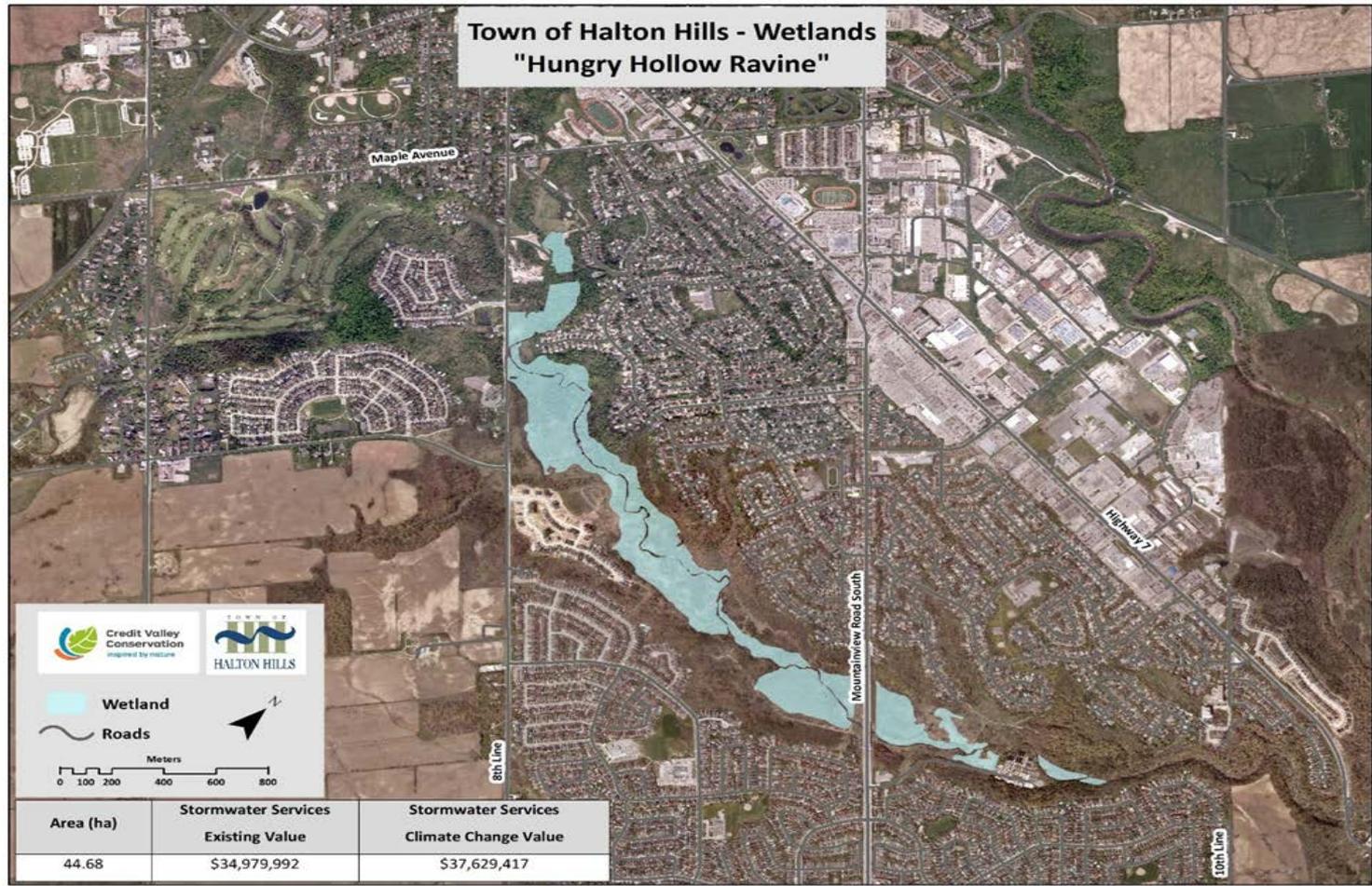
# Example - Hungry Hollow Ravine

## Value of SWM Services: *Woodlands*



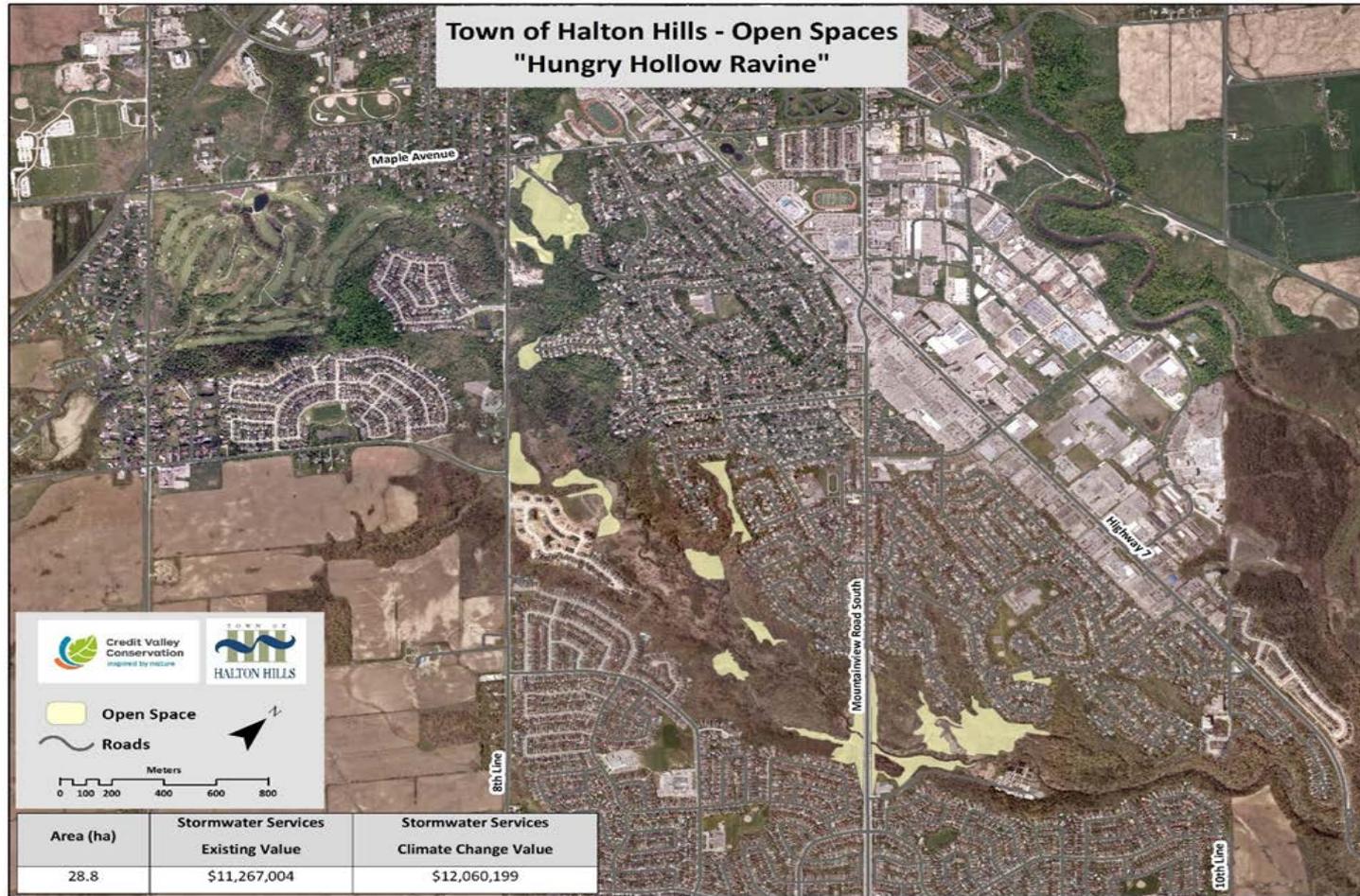
# Example - Hungry Hollow Ravine

## Value of SWM Services: *Wetlands*



# Example - Hungry Hollow Ravine

## Value of SWM Services: Open Space



# Next Steps for Phase 2 (2020 and beyond)

## Natural Assets Registry and Management Scenarios

- Selecting case study location(s)
- Conducting a workshop to identify:
  - Threats and risks to these assets and their services
  - Potential effects of these risks on condition and level of service
- Performing a condition assessment and a risk assessment
- Quantifying additional services, such as *Carbon Sequestration* and *Recreation/Tourism*
- Estimating replacement cost of the natural assets in the study area(s)
- Where practical, identifying management scenarios for the natural assets, including basic maintenance and enhancement
- Developing an interactive asset registry

# Natural Assets: Condition Assessment

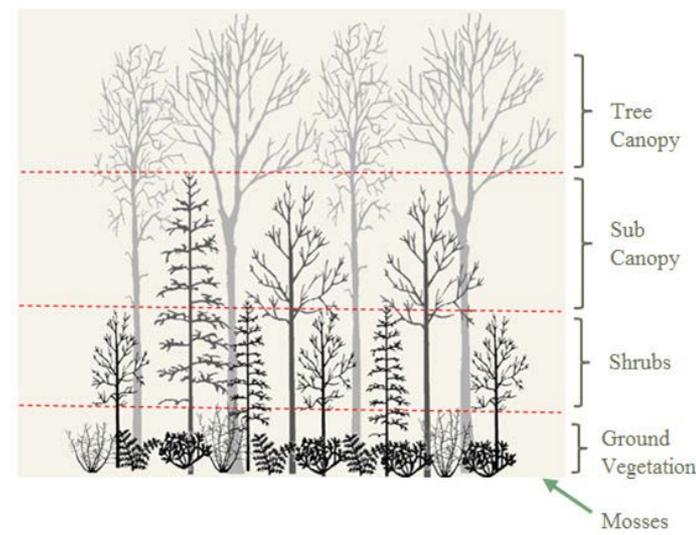
Rating	Condition	Definition (check if any apply)
1	Very Good	<ul style="list-style-type: none"> <li>Fit for the future. Well maintained, good condition.</li> <li>New or recently rehabilitated.</li> </ul>
2	Good	<ul style="list-style-type: none"> <li>Good working condition.</li> <li>Generally approaching mid-stage of expected service life.</li> </ul>
3	Fair	<ul style="list-style-type: none"> <li>Signs of deterioration, some elements exhibit deficiencies.</li> <li>Mid-stage of expected service life.</li> </ul>
4	Poor	<ul style="list-style-type: none"> <li>Condition below standard, large portion of system exhibits significant deterioration.</li> <li>Approaching end of service life.</li> </ul>
5	Very Poor	<ul style="list-style-type: none"> <li>Widespread signs of advanced deterioration, asset may be unusable.</li> <li>Near or beyond expected service life.</li> </ul>

- Assess the quality of a natural asset
- Present condition assessment information similar to built assets

## Visuals/handouts:

## Factors to be assessed (examples)

<p><b>Canopy/vegetation-related (tree size, dead wood, invasives etc.)</b></p>	<p><b>Human use-related (dumping, trails, encroachment)</b></p>
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# Natural Assets: Level of Service

Benefit Provided by Natural Assets	Link to Municipal Service /Policy Objectives	Quantification Metric	Valuation Method	Relevant Natural Asset Types
<b>Stormwater quantity reduction and quality improvement</b>	Explicit link to stormwater management (SWM)	Hectares of natural assets relevant to stormwater management	Unit value benefit transfer ; per hectare values specific to natural asset type	Forests; wetlands; grassland
<b>Recreation and tourism</b>	Supports parks and recreation services, municipal tourism objectives	Hectares of natural assets relevant to recreational opportunities	Unit value benefit transfer; per hectare values specific to natural asset type	Forests; wetlands; grassland; open space/parks
<b>Drinking water provision and quality improvement</b>	Strong link to core municipal service of providing drinking water to residents	Hectares of natural assets relevant to drinking water provision	Unit value benefit transfer; per hectare of natural asset	Forests; wetlands; grasslands; aquifers
<b>Reduction of heat stress</b>	Linked with public health; strong policy relevance to climate change adaptation objectives	Estimate the reduction in daily high air temperatures linked to natural assets	Avoided cost of mortality in June, July, & August associated with daily high temperatures	Forests; wetlands; grassland

# Natural Assets: Level of Service

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## contd.

Benefit Provided by Natural Assets	Link to Municipal Service /Policy Objectives	Quantification Metric	Valuation Method	Relevant Natural Asset Types
<b>Air quality improvement</b>	Link to public health	Estimated pollutant concentration reduction per hectare of natural asset	Avoided cost of negative health impacts per hectare	Forests
<b>Carbon sequestration</b>	Strong policy relevance to climate change mitigation objectives	Tonnes of carbon sequestered by asset type	Social cost of carbon	Forests; wetlands; grassland
<b>Aesthetic/ Property Value appreciation</b>	Strong link to tourism objectives and property tax collection	Property value increase	Hedonic pricing methods	Forests; wetlands; grassland; greenspace

# Management Actions: example

Service	Management Action	Net Present Value \$	Benefit Cost Ratio
Stormwater	Salt		
	Invasive Species		
	Overuse (10 year lifespan)		
	Overuse (15 year lifespan)		
	Overuse (20 year lifespan)		
Urban Heat Island	Salt		
	Invasive Species		
	Overuse (10 year lifespan)		
	Overuse (15 year lifespan)		
	Overuse (20 year lifespan)		

# Thank You

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